

An Entangled Trio

Gravity, Information and Condensed Matter

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8-12

Organized by Institute for Advanced Study,
Tsinghua University, Beijing, China

The three subjects of this workshop seem to belong to distant domains of scientific inquiry, but they are in fact intimately related. Gravity and Information were first linked up by Hawking who understood that the information (entropy) carried by a black hole manifests itself as a horizon area and concluded that black hole evaporation leads to a baffling loss of information. Gravity and Condensed Matter came together with the discovery of the AdS/CFT correspondence, a duality between gravitational theories and our most robust formalism for studying critical systems. Information, or quantum entanglement, has a profound importance in

Condensed Matter physics: it is used to distinguish exotic phases of matter, but also to model critical systems in lattice settings by using tensor networks. In the last decade, we have learned that these and similar connections run deeper than was previously appreciated. Many new interrelations have been proven and conjectured, including the assertions that entanglement is the glue that keeps spacetime from falling apart or that spacetime is a tensor network. In this workshop, we will try to prove or disprove a few such statements, conjecture new ones, and learn the true meaning of “It from Bit.”

Invited Speakers:

Daniel Harlow (Harvard University / MIT)
Michał Heller (Perimeter Institute)
Ling-Yan Hung (Fudan University)
Lampros Lamprou (Stanford University)
Samuel McCandlish (Stanford University)
Joan Simón (University of Edinburgh)
Herman Verlinde (Princeton University)
Beni Yoshida (Perimeter Institute)
Jan Zaanen (Leiden University)

Organizers:

Bartłomiej Czech
(Stanford University/IAS Princeton)
Xiaoliang Qi
(Stanford University)
Cenke Xu
(University of California at Santa Barbara)



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